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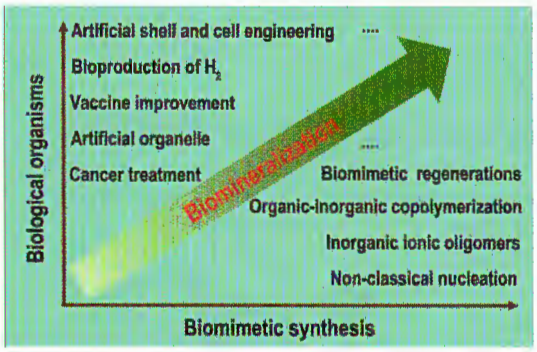
Chemistry Authors Up Close

Biomineralization: Biomimetic Synthesis of Materials and Biomimetic Regulation of Organisms

Zaiqiang Ma, Benke Li, and Ruikang Tang*

Chin. J. Chem. **2021**, *39*, 2071—2082. **DOI: 10.1002/cjoc.202100119**



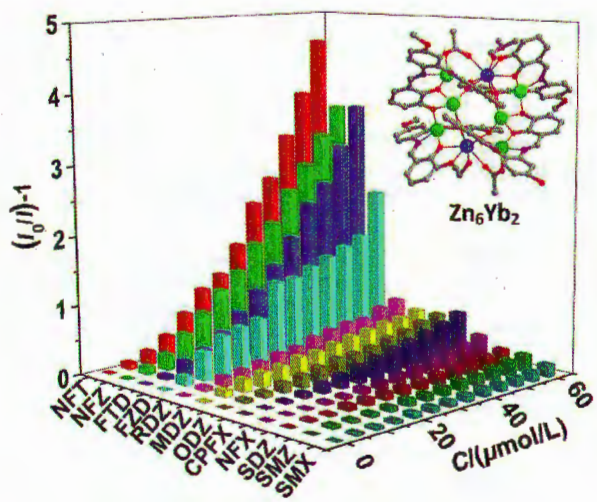
A study of biomineralization reveals a new understanding of crystallization leading to a discovery of inorganic ionic oligomers, which can be used as the conformable precursors for the moldable constructions of inorganic and organic-inorganic materials. By using biomimetic mineralization, we can not only achieve regeneration/repair of hard tissues, but also improve biological organisms, following an evolution of biomineralization study from biomimetic synthesis of materials to biomimetic regulation of organisms by using materials.

Concise Reports

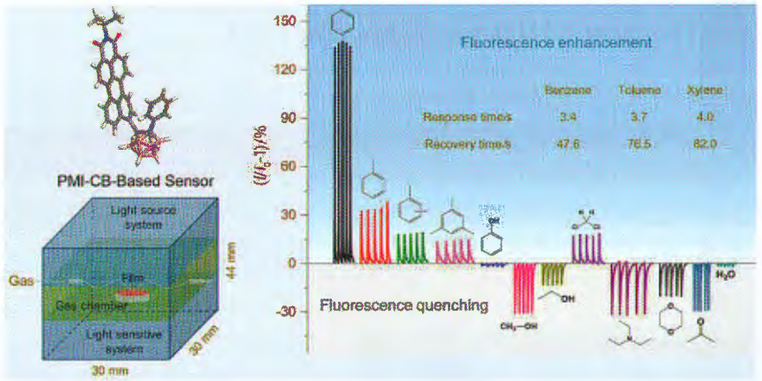
Construction of an Octanuclear Zn(II)-Yb(III) Schiff Base Complex for the NIR Luminescent Sensing of Nitrofuran Antibiotics

Mengyu Niu, Xiaoping Yang,* Yanan Ma, Chengri Wang, Wenxin Hao, Dongliang Shi, and Desmond Schipper

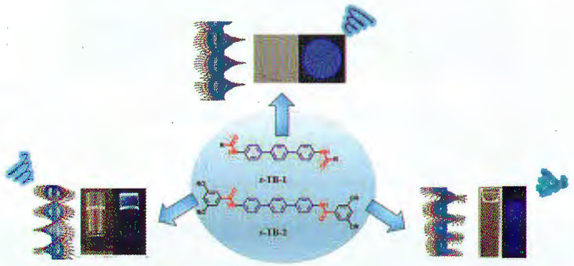
Chin. J. Chem. **2021**, *39*, 2083—2087. **DOI: 10.1002/cjoc.202100049**

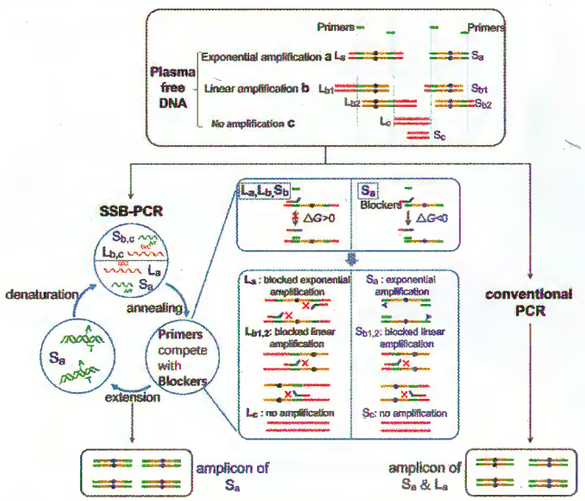


One octanuclear Zn(II)-Yb(III) complex $[Zn_6Yb_2L_4(OAc)_2(DMF)EtOH]$ with NIR luminescent response towards antibiotics was constructed.

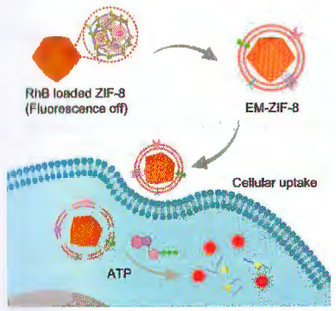


A new perylene monoimide derivative (PMI-CB) was synthesized through the introduction of a three-dimensional *o*-carborane unit. The PMI-CB film packed into a miniaturized fluorescent sensor exhibited high sensitivity and selectivity in BTX (*i.e.*, benzene, toluene, xylene) sensing.

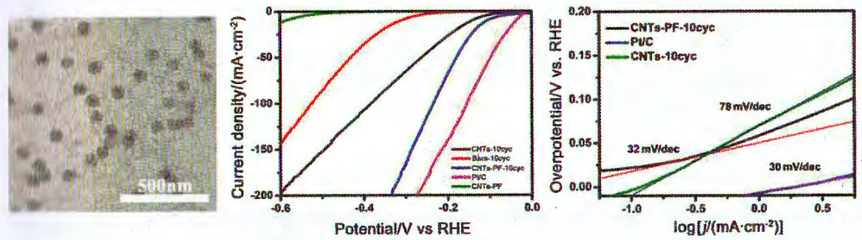




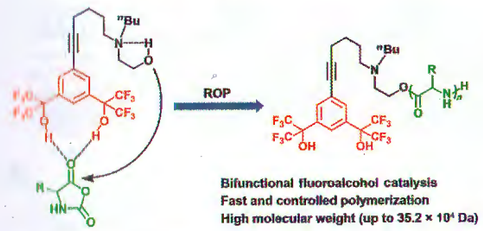
We developed the SSB-PCR (Short-DNA Specific Blocker PCR) technology to enrich the cell free fetal DNAs with short lengths in an efficient and simple way. We believe that this method has great potential to achieve accurate, fast, and cost-effective non-invasive prenatal testing.



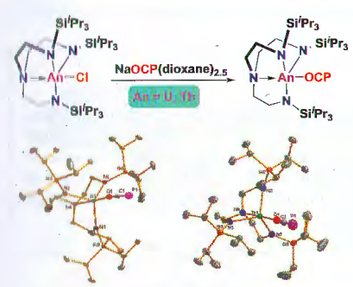
Exosome membrane-coated zeolitic imidazolate framework-8 (EM-ZIF-8) nanoparticles are fabricated through a microfluidic sonication approach. The devised biomimetic EM-ZIF-8 nanoparticles are a highly efficient platform for intracellular drug delivery and ATP sensing.



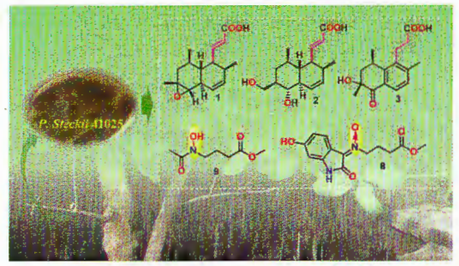
A highly efficient hydrogen-evolution electrode was successfully fabricated by PF-assisted CoPi amorphously electrodeposited onto PF-CNTs substrates through π-π stacking interactions. The obtained CoPi/PF-CNTs catalysts demonstrated high catalytic activity and stability for HER in acidic electrolyte.



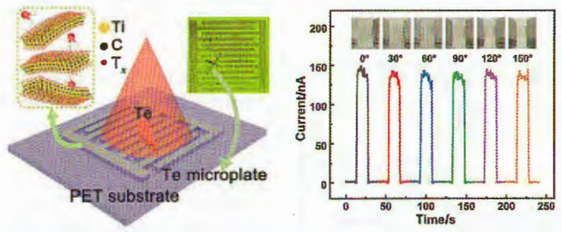
A novel bifunctional single-molecule hydrogen-bonding organocatalyst based on fluorinated tertiary alcohols was designed to mediate the metal-free polymerization of α-amino acid *N*-carboxyanhydride monomer.



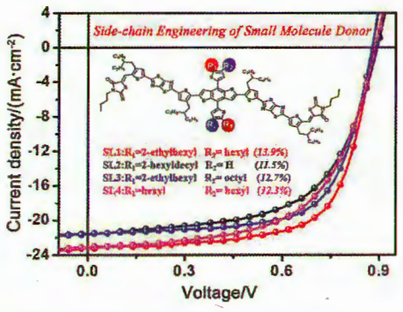
Tren-supported actinide (U, Th) complexes containing O-bound phosphaethynolate have been synthesized *via* salt metathesis approach. The structures of [U(Tren^{TIPS})(OCP)] and [Th(Tren^{TIPS})(OCP)] were identified by NMR and X-ray crystal diffraction. The electronic structures and bonding characteristic of the two complexes have indicated that U—O σ bonds have a more covalent character compared to Th—O bonds based on the theoretical calculations.



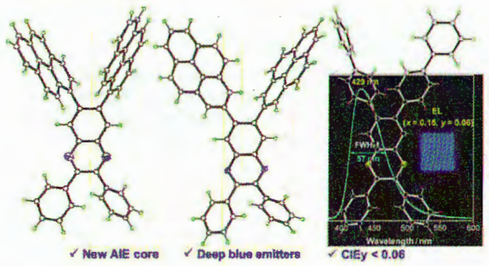
Three highly oxygenated decalin derivatives harboring uncommon propanoic acid units and two rare natural amine-*N*-oxides were obtained from the mangrove endophytic fungus *Penicillium steckii* SCSIO 41025.



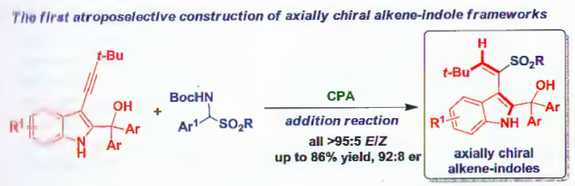
A Ti_3C_2 MXene-Te microplate van der Waals heterostructure based transparent near-infrared photodetector (PD) is exploited.



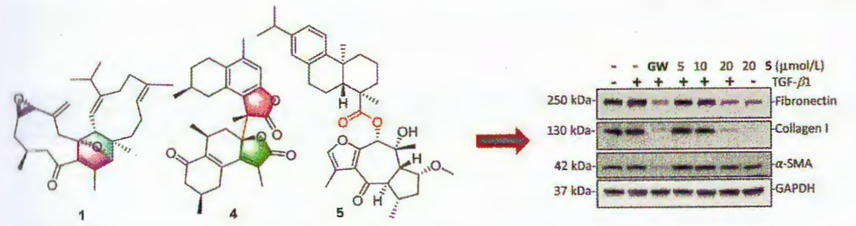
Side-chain engineering as one of the most important molecular design strategies has been widely used to improve photovoltaic efficiency of active layer materials. In this work, we regulated the crystallinity of the small molecule donors and their miscibility with the acceptor via the suitable selection of the alkyl substitution on the side chains of the BDT-T, and revealed what is the most suitable aggregation degree to achieve the satisfying blend film morphology and device performance.



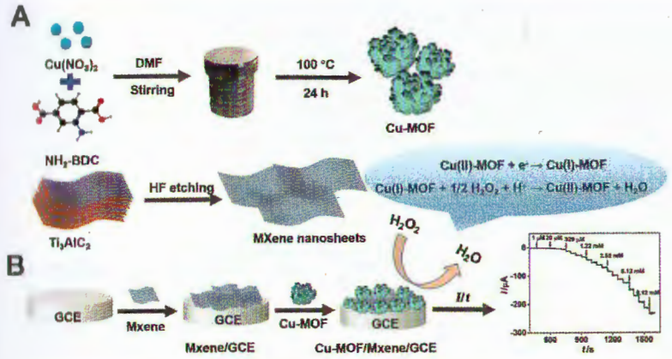
New deep blue light emitters, containing quinoxaline and pyrene (biphenyl) moieties are presented, which display both intramolecular charge transfer and aggregation-induced emission characteristics. More importantly, the selected blue emitter gives a deep blue electroluminescence (EL) peak at 428 nm with a narrow FWHM of 57 nm in doped OLED devices, and the Commission Internationale de L'Eclairage (CIE) chromaticity coordinate of (0.15, 0.06).



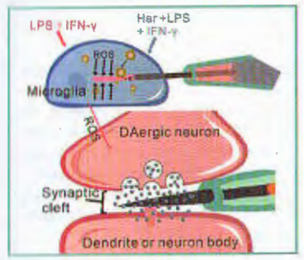
An atroposelective construction of axially chiral alkene-indole scaffolds has been established *via* the strategy of catalytic enantioselective addition reaction of 3-alkynyl-2-indolylmethanols with α-amido sulfones in the presence of chiral phosphoric acid. By this strategy, a new class of axially chiral acyclic alkene-indoles was synthesized in overall high yields (up to 86%), excellent (*E*/*Z*)-selectivity (all > 95 : 5) and good enantioselectivities (up to 92 : 8 er). This reaction represents the first catalytic enantioselective construction of axially chiral alkene-indole frameworks.



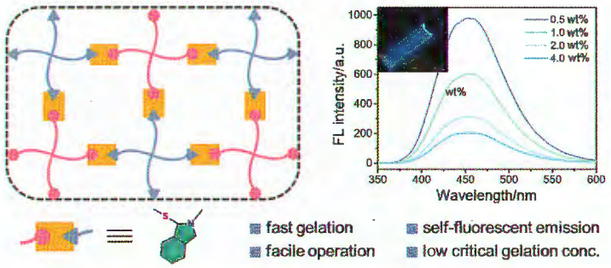
One of five natural terpenoids isolated from *Resina Commiphora* inhibits renal fibrosis by reducing fibronectin, collagen I and α-SMA expressions.



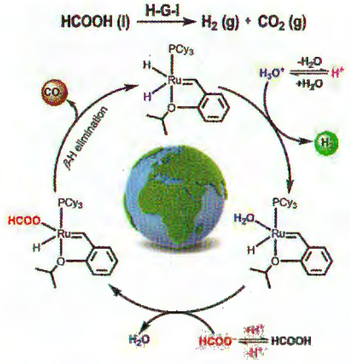
The Scheme illustates the preparation of 3D flower-like Cu-MOF and ultra-thin MXene nanosheets (A), and the fabrication procedures of the Cu-MOF/MXene modified electrode for the electrochemical detection of H_2O_2 (B).



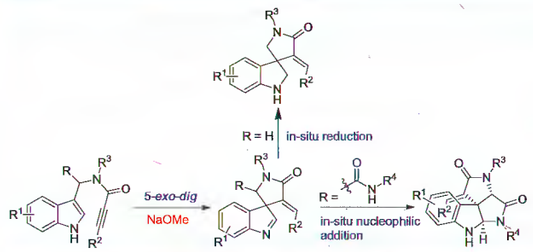
In this work, nanoelectrode amperometry was used to investigate how natural product harpagide inhibits microglia activation and protects DAergic neurons. Intracellular monitoring with single platinized SiC@C NWEs showed that harpagide can efficiently decrease intracellular ROS concentration in microglia suffering activation by inflammatory factors LPS and IFN-γ; Intra-synapse monitoring using CFNEs indicated that harpagide can effectively protect DAergic neuron exocytosis function from microglial inflammation. The results indicate that harpagide inhibits microglia from activation, reduces inflammation-mediated neural injury and maintains dopamine exocytosis function. These conclusions establish that harpagide possesses promising avenues for preventive or therapeutic interventions against PD and other NDDs.



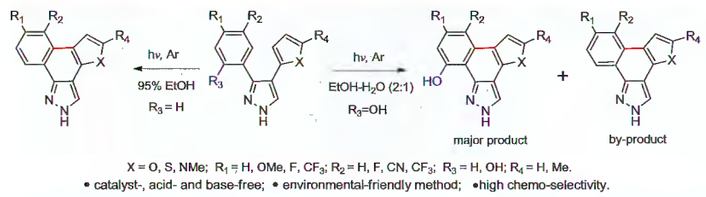
Herein, we applied the ternary condensation reaction of *o*-phthalaldehyde (OPA) with thiol and amino moieties to construct hydrogel networks with fast gelation rate, excellent mechanical strength, and favorable stability. The OPA ternary condensation reaction was a simple and universal strategy towards fabrication of natural or synthetic polymer gels from polysaccharides, proteins, and synthetic polymers, which is expected to have potential biomedical applications.



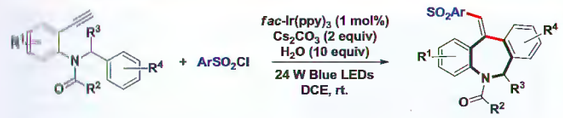
Dehydrogenation of formic acid for hydrogen production using Grubbs and Hoveyda-Grubbs catalysts was investigated.



Polycyclic indolines and indolenines were synthesized *via* base-catalyzed intramolecular dearomatizing 3-alkenylation reactions of alkynyl indoles at room temperature.

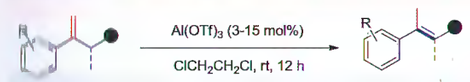


A catalyst-, acid- and base-free, environmental-friendly method for synthesis of 2*H*-benzo[g]furo/thieno/pyrrolo[2,3-*e*]indazoles derivatives *via* irradiation of 3-phenyl-4-(2-heteroaryl)pyrazoles in EtOH/H_2O with UV light at room temperature under argon atmosphere was described. Irradiation of 3-(2-hydroxyphenyl)-4-(2-heteroaryl)pyrazoles showed a high chemoselectivity to obtain dehydrogenation product 2*H*-benzo[g]furo/thieno/pyrrolo[2,3-*e*]indazols-10-ol.



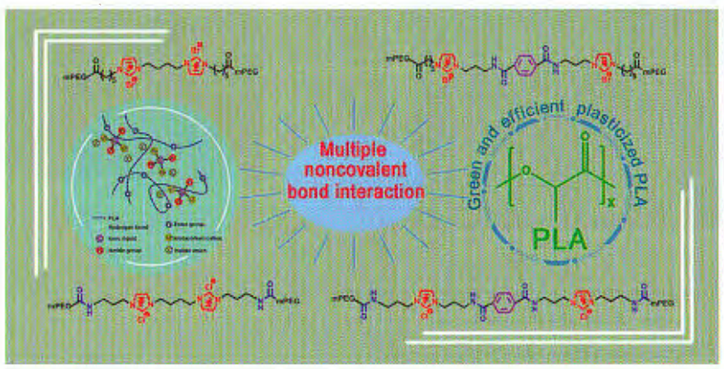
• operationally simple • biologically relevant scaffolds • ample acope • scalable

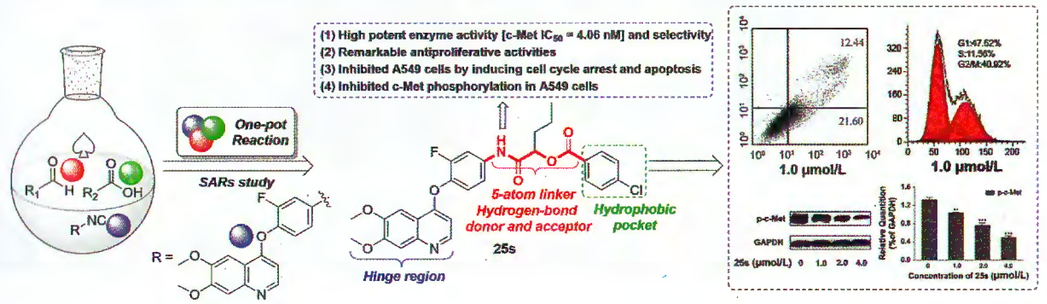
Highly functionalized sulfonated dibenzazepines were rapidly assembled using Ugi products and commercially accessible sulfonyl chlorides in one step *via* photoredox.

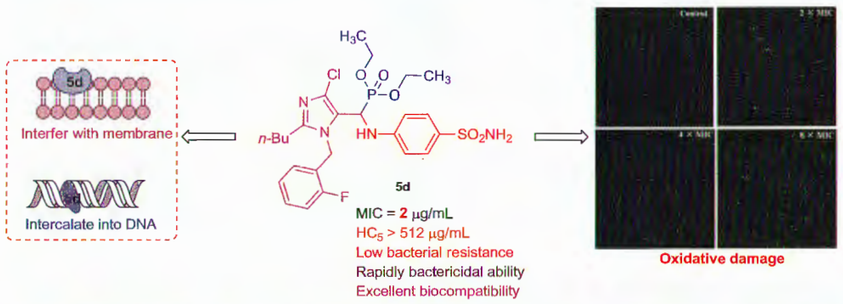


The first transition-metal-free highly stereoselective positional isomerization of various α-alkyl styrenes through a carbocation mechanism is developed by using $Al(OTf)_3$ as a hidden Brønsted acid catalyst.

Comprehensive Reports



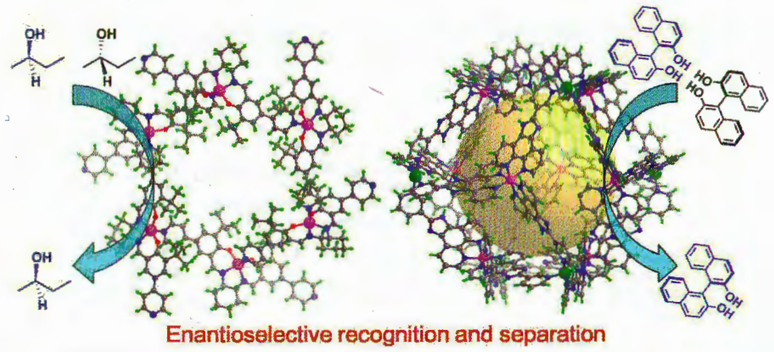




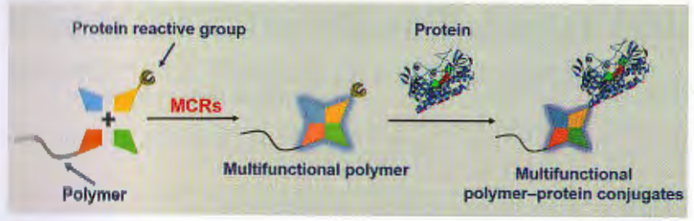
A class of unique sulfanilamide aminophosphonates as new regulators against microbes was synthesized by one-pot three-component reaction and their biological evaluations indicated that sulfanilamide aminophosphonates would shed light on developing novel potential antibacterial agents to combat with microbial infection.

Recent Advances

Prebiotic peptide synthesis and its relationship with genetic code origin on the plausible early Earth environments were reviewed. Their interactions could promote the chemical evolution of life molecules in the prebiotic chemical process.



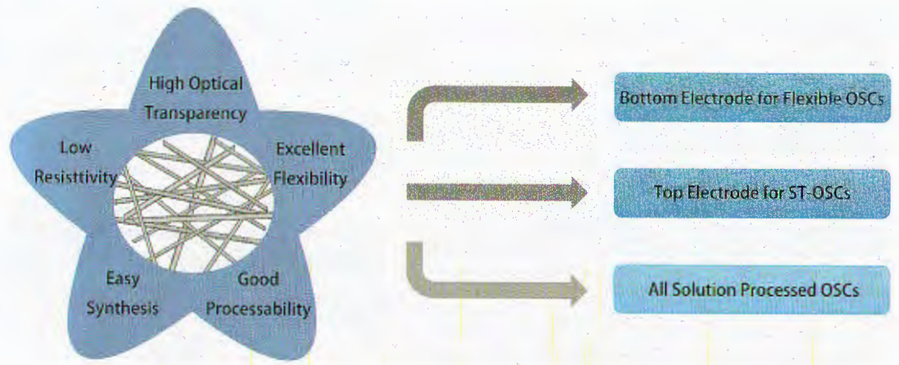
Recent progress on chiral coordination metallacycles/metallacages with inherent cavities for enantionselective recognition and separation is summarized, including their design principles and synthesis, the introduction of chirality and functionality, structural adaptability, and enantioselective process.



Recent development of multifunctional polymer-protein conjugates facilely prepared via different multicomponent reactions has been summarized.

Critical Review

This review article provides a comprehensive summary, discussion and perspective on recent research advances for a new kind of multifunctional fire-resistant paper based on ultralong hydroxyapatite nanowires, including the synthesis, properties, and applications.



AgNW, as an emerging transparent conducting electrode, owns the advantages of high conductivity, high transparency, excellent mechanical flexibility and good solution processability. Thus, AgNW-based TCEs have become a promising candidate in serving as both bottom and top electrode in flexible and semi-transparent OSCs.